

SSME F A/CIL
REDUNDANCY SCREEN

Component Group: Ducts and Lines
 CIL Item: K205-01
 Part Number: RS007021
 Component: High Pressure Oxidizer Duct
 FMEA Item: K205, K208
 Failure Mode: Fails to contain oxidizer.

Prepared: D. Early
 Approved: T. Nguyen
 Approval Date: 7/25/00
 Change #: 1
 Directive #: CCBBD ME3-01-5638

Page: 1 of 1

Phase	Failure / Effect Description	Criticality Hazard Reference
PSMCD 4.1	Oxidizer leakage into aft compartment. Oxidizer leakage results in reduced flow to downstream system(s). Overpressurization of aft compartment. Loss of vehicle. Redundancy Screens: SINGLE POINT FAILURE: N/A	1 ME-C3P,D, ME-C3S, ME-C3M, ME-C3A,C

SSME FMEA/CIL
DESIGN

Component Group: Ducts and Lines
CIL Item: K205-01
Part Number: RS007021
Component: High Pressure Oxidizer Duct
FMEA Item: K205, K208
Failure Mode: Fails to contain oxidizer.

Prepared: D. Early
Approved: T. Nguyen
Approval Date: 7/25/00
Change #: 1
Directive #: CCBD ME3-01-5638

Page: 1 of 1

Design / Document Reference

FAILURE CAUSE: A: Parent material failure or weld failure of duct.
B: Parent material failure of plate.

THE DUCT ASSEMBLY (1) IS MANUFACTURED UTILIZING INCONEL 718 TUBING, BAR, AND FORGINGS. INCONEL 718 WAS SELECTED FOR ITS STRENGTH, RESISTANCE TO STRESS CORROSION, CORROSION RESISTANCE, HIGH/LOW CYCLE FATIGUE CHARACTERISTICS, AND WELDABILITY (2). MATERIALS ARE HEAT TREATED TO DEVELOP FULL MATERIAL STRENGTH AND HARDNESS (2). THE COVER PLATE (3) IS MANUFACTURED FROM 321 CRES BAR. THIS MATERIAL WAS SELECTED FOR ITS STRENGTH, FABRICABILITY, GENERAL CORROSION RESISTANCE, AND STRESS CORROSION RESISTANCE (2). ALL MATERIALS USED IN THE DUCT FABRICATION ARE LOX COMPATIBLE (2). FLANGE SECTIONS INCORPORATE RADIUS JOINTS TO REDUCE STRESS CONCENTRATIONS. OFFSET LIMIT REQUIREMENTS ARE ESTABLISHED TO REDUCE STRESS CONCENTRATIONS AND IMPROVE WELD GEOMETRY. TUBING STOCK IS PLANISHED WHEN WELDED, OR DRAWN TO MAINTAIN SURFACE REGULARITY. INSTALLATION IS CONTROLLED FOR ANGULARITY AND OFFSET (4). MINIMUM FACTORS OF SAFETY FOR THE DUCT MEET CEI REQUIREMENTS (5). HIGH AND LOW CYCLE FATIGUE LIFE MEET CEI REQUIREMENTS (6). THE DUCT ASSEMBLY HAS COMPLETED PRESSURE CYCLING AND ULTIMATE PRESSURE DVS TESTING (7). THE DUCT ASSEMBLY PARENT MATERIAL WAS CLEARED FOR FRACTURE MECHANICS/NDE FLAW GROWTH, SINCE THEY ARE NOT FRACTURE CRITICAL PARTS (8). TABLE K205 LISTS ALL THE FMEA/CIL WELDS AND IDENTIFIES THOSE WELDS IN WHICH THE CRITICAL INITIAL FLAW SIZE IS NOT DETECTABLE, AND THOSE WELDS IN WHICH THE ROOT SIDE IS NOT ACCESSIBLE FOR INSPECTION. THESE WELDS HAVE BEEN ASSESSED AS ACCEPTABLE FOR FLIGHT BY RISK ASSESSMENT (9).

(1) RS007021; (2) RSS-8575, RSS-8582; (3) RS007167; (4) I.L. 0126-8066; (5) RSS-8546, CP320R0003B; (6) RL00532, CP320R0003B; (7) RSS-511-43; (8) NASA TASK 117; (9) RSS-8756

**SSME FME AIL
INSPECTION AND TEST**

Component Group: Ducts and Lines
 CIL Item: K205-01
 Part Number: RS007021
 Component: High Pressure Oxidizer Duct
 FMEA Item: K205, K208
 Failure Mode: Fails to contain oxidizer.

Prepared: D. Early
 Approved: T. Nguyen
 Approval Date: 7/25/00
 Change #: 1
 Directive #: CCBd ME3-01-5638

Page: 1 of 1

Failure Causes	Significant Characteristics	Inspection(s) / Test(s)	Document Reference
A, B	DUCT PLATE		RS007021 RS007167
	MATERIAL INTEGRITY	MATERIAL INTEGRITY IS VERIFIED PER DRAWING REQUIREMENTS.	RS007021 RS007167
	HEAT TREAT	HEAT TREAT IS VERIFIED PER SPECIFICATION REQUIREMENTS.	RA0611-020
	SURFACE FINISH	DETAILS ARE PENETRANT INSPECTED PER SPECIFICATION REQUIREMENTS.	RA0115-116
	WELD INTEGRITY	ALL WELDS ARE INSPECTED TO DRAWING AND SPECIFICATION REQUIREMENTS PER WELD CLASS. INSPECTIONS INCLUDE: VISUAL, DIMENSIONAL, PENETRANT, RADIOGRAPHIC, ULTRASONIC, AND FILLER MATERIAL, AS APPLICABLE.	RL10011 RA0607-094 RA0115-116 RA0115-006 RA1115-001 RA0115-127
	ASSEMBLY INTEGRITY	THE ASSEMBLY IS PROOF PRESSURE TESTED PER DRAWING REQUIREMENTS. EXTERIOR SURFACE OF DUCT IS INSPECTED FOR EXCESSIVE SURFACE DEFECTS. CIRCUMFERENTIAL AND LONGITUDINAL WELDS ARE PENETRANT INSPECTED AFTER PROOF TEST.	RS007021 RS007021 RA0115-116
	FLIGHT FLOW TESTING	THE EXTERNAL SURFACE IS VISUALLY INSPECTED PRIOR TO EACH LAUNCH. A HELIUM SIGNATURE LEAK TEST IS PERFORMED PRIOR TO EACH FLIGHT. (LAST TEST)	OMRSD V41BU0.030 OMRSD S00000.950

Failure History: Comprehensive failure history data is maintained in the Problem Reporting database (PRAMS/PRACA)

Reference: NASA letter SA21/88/308 and Rocketdyne letter 88RC09761.

Operational Use: Not Applicable.

SSME FMEA/CIL
WELD JOINTS

Component Group: Ducts and Lines
 CIL Item: K205
 Part Number: RS007021
 Component: High Pressure Oxidizer Duct
 FMEA Item: K205, K208

Prepared: D. Early
 Approved: T. Nguyen
 Approval Date: 7/25/00
 Change #: 1
 Directive #: CCBD ME3-01-5638
 Page: 1 of 1

Component	Basic Part Number	Weld Number	Weld Type	Class	Root Side Not Access	Critical Initial Flaw Size Not Detectable		Comments
						HCF	LCF	
DUCT	RS007021	3	GTAW	I		X	X	
DUCT	RS007021	4	GTAW	I		X	X	
DUCT	RS007021	5	GTAW	I	X	X	X	
DUCT	RS007021	6	GTAW	I		X	X	
DUCT	RS007021	7	GTAW	I		X		